B1 (cont'd

analogous to the foregoing catalytic reactor descriptions, with suitably dimensioned reactor compartment(s) in place of the catalytic bed(s).

IN THE CLAIMS:

Please cancel claims 28, 39, and 47.

Please replace claims 19, 21, 22, 31, 32, 36, 37, and 44-46 with the following claims:

B2

19. (Amended) A reactor comprising

(a) a reaction zone; and

(b) a heat exchanger in operative contact with the reaction zone so as to receive reactants for heat exchange purposes, wherein the heat exchanger is formed from a heat exchange panel that includes a plurality of superposed metal printed circuit heat exchange (PCHE) plates bearing fluid flow channels, the channel-bearing PCHE plates being (i) aligned during superposition to define discrete heat exchange pathways for fluids, and (ii) diffusion bonded together.

B3

21. (Amended) A reactor according to claim 19, wherein the fluid flow channels are formed by chemically etching the channel-bearing PCHE plates.

22. (Amended) A reactor according to claim 19, wherein the fluid flow channels are formed by hydraulically milling the channel-bearing PCHE plates.

B4

31. (Amended) A process of fluid reactant conversion comprising:

(a) providing a reactor including a reaction zone and a printed circuit heat exchanger (PHCE) in operative contact with the reaction zone;

(b) providing a fluid reactant species to be converted in the reaction zone;

(c) introducing at least a portion of the fluid reactant species into the reaction zone at a predetermined stage of reaction through a discrete reactant fluid pathway within the PCHE; and

(d) introducing an auxiliary fluid at a temperature differing from that of the fluid reactant species into another discrete fluid pathway within the heat exchanger and juxtaposed to the reactant fluid pathways, whereby the discrete nature of the respective pathways permits only indirect heat exchange between the fluid reactant species and the auxiliary fluid.

32. (Amended) An apparatus for controlling a temperature profile of a reactant fluid in the presence of a catalyst during an endothermic or exothermic chemical reaction, the apparatus comprising:

(a) a reactor having a reactant fluid inlet and reactant fluid outlet;

(b) catalytic beds provided in the reactor between the reactant fluid inlet and the reactant fluid outlet;

(c) a printed circuit heat exchanger (PCHE) that separates two adjacent catalytic beds from one another, the PCHE including a heat exchanging fluid inlet, a heat exchanging fluid outlet, a first channel for passage of a heat exchanging fluid, and a second channel in communication with the adjacent catalytic beds to allow passage of a

B4 cont'd

reactant fluid from one catalytic bed to the next, the second channel being separated from the first channel to maintain separation of the heat exchange fluid and the reactant liquid.

B5

36. (Amended) A process for indirectly controlling a temperature profile of a reactant fluid in the presence of a catalyst during an endothermic or exothermic chemical reaction, the processing comprising:

(a) passing the reactant fluid from a reactant fluid inlet in a reactor through a first catalytic bed,

(b) then passing the reactant fluid through a first channel in a printed circuit heat exchanger (PCHE);

(b) then passing the reactant fluid through a second catalytic bed;

(c) passing a heat exchanging fluid from a heat exchanging inlet in the PCHE to a heat exchanging outlet through a second channel in the PCHE, the first and second channels being separated from one another; and

(d) indirectly exchanging heat between the heat exchanging fluid and the reactant fluid in the PCHE.

37. (Amended) A reactor comprising:

(a) a reactant fluid inlet;

(b) a reactant fluid outlet;

(c) first and second adjacent catalyst beds each including a catalyst;

B5

(d) a printed circuit heat exchanger (PCHE) arranged between the first and second catalyst beds, the PCHE including at least two channels formed therein that are separated from one another, the first channel permitting flow of reactant fluid from the first catalytic bed to the second catalytic bed, and the second channel permitting flow of a heat exchange fluid therethrough.

B6

44. (Amended) A method of making a reactor, comprising:

(a) providing a reactor shell having a reaction zone disposed therein;

(b) making a heat exchange panel by

1) superpositioning metal printed circuit heat exchange (PHCE) plates such that surface structures on the metal PCHE plates form fluid flow channels between adjacent metal plates, and

2) diffusion bonding the metal PCHE plates together; and

(c) positioning the heat exchange panel in the reactor shell in operative contact with the reaction zone so as to receive reactants and auxiliary fluids for indirect heat exchange purposes.

45. (Amended) A method according to claim 44, wherein the fluid flow channels are formed by chemically etching the surfaces of the metal PCHE plates.

46. (Amended) A method according to claim 44, wherein the fluid flow channels are formed by hydraulically etching the surfaces of the metal PCHE plates.